



Flood Risk Assessment and Drainage Appraisal

Proposed Development

Speke Road, Garston

LIVERPOOL

L19 2PA

Client: Netto UK Ltd

Project Address: Speke Road, Garston, Liverpool

Project Number: 15327

Date: 27 October 2015

Directors:
Associates:

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Registered in England & Wales: 6997283



Table of Contents

1.0	Introduction.....	2
2.0	References & Standards.....	2
3.0	The Site.....	2
4.0	Sources of Flooding and Flood Risk.....	4
5.0	Drainage Appraisal	8
6.0	Conclusions.....	10

Appendices

- A. Existing site aerial plan
- B. Existing site plan (topographical survey)
Proposed site plan
- C. BGS borehole location plan and BGS borehole logs

1.0 Introduction

- 1.1 This report provides an initial assessment of the flood risk of a proposed retail development off Speke Road, Garston, Liverpool. This report has been produced to support a planning application. It shows that the necessary investigation of flood risks has been carried out.

2.0 References & Standards

- 2.1 This Flood Risk Assessment has been carried out generally in accordance with:
- North Yorkshire County Council SuDS Design Guidance (2015)
 - National Planning Policy Framework (March 2012)
 - Planning Practice Guidance: Flood Risk and Coastal Change
 - BS8533:2011 “Assessing and managing flood risk in development, Code of Practice”
 - CIRIA Report 697 “The SUDS Manual” 2007

3.0 The Site

- 3.1 The site is located off Speke Road, Garston, on the outskirts of Liverpool.
- 3.2 The site was historically agricultural fields, and has been developed with buildings since the 1950s.
- 3.3 The site is bounded by Speke Road, and commercial properties to the North, Arthur Street, Horrocks Avenue and commercial properties to the East, the A561 Speke Road, and railway lines to the South, and commercial properties West.
- 3.4 The approximate grid reference of the site is E340571, N384410 and LR SJ 405844.
- 3.5 A location plan is shown overleaf and a site aerial location plan is included in Appendix A of this report.



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Figure 1: Location plan

- 3.6 The proposal for the site is to construct a new supermarket and associated parking. An existing site plan, and a proposed site plan by the Architect are included in Appendix B of this report.
- 3.7 As existing the site slopes down towards the western boundary.
- 3.8 The total area of the site is approximately 4000m², 0.40 hectares.

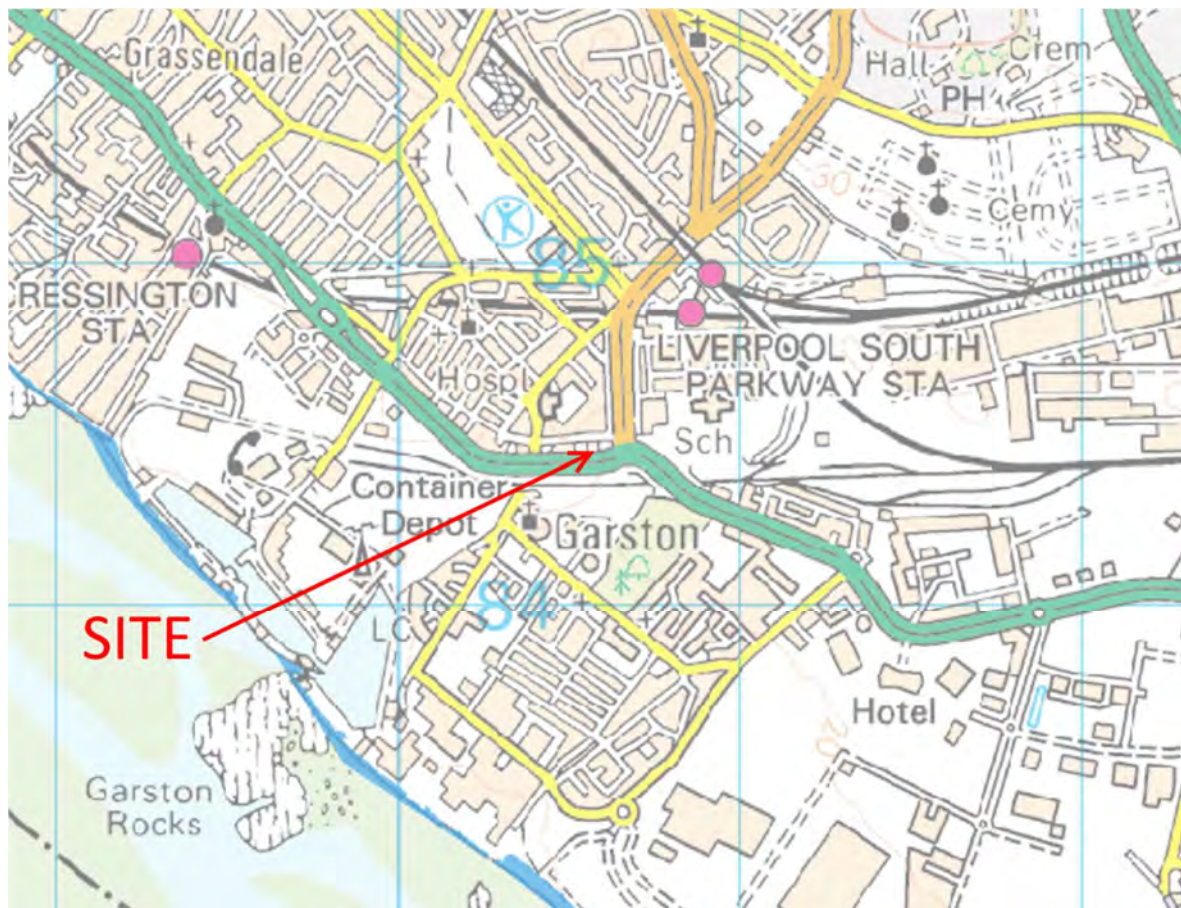
4.0 Sources of Flooding and Flood Risk

4.1 Flooding from Rivers and Watercourses (Fluvial Flooding)

4.2 A flood map of the area has been obtained, as shown below.

4.3 The flood map, Figure 2, states that the site is in Flood Zone 1, very low risk. Land assessed as having a less than 1 in 1000 annual probability of river or sea flooding (<0.1%).

4.4 Flooding from rivers and watercourses is considered low risk.

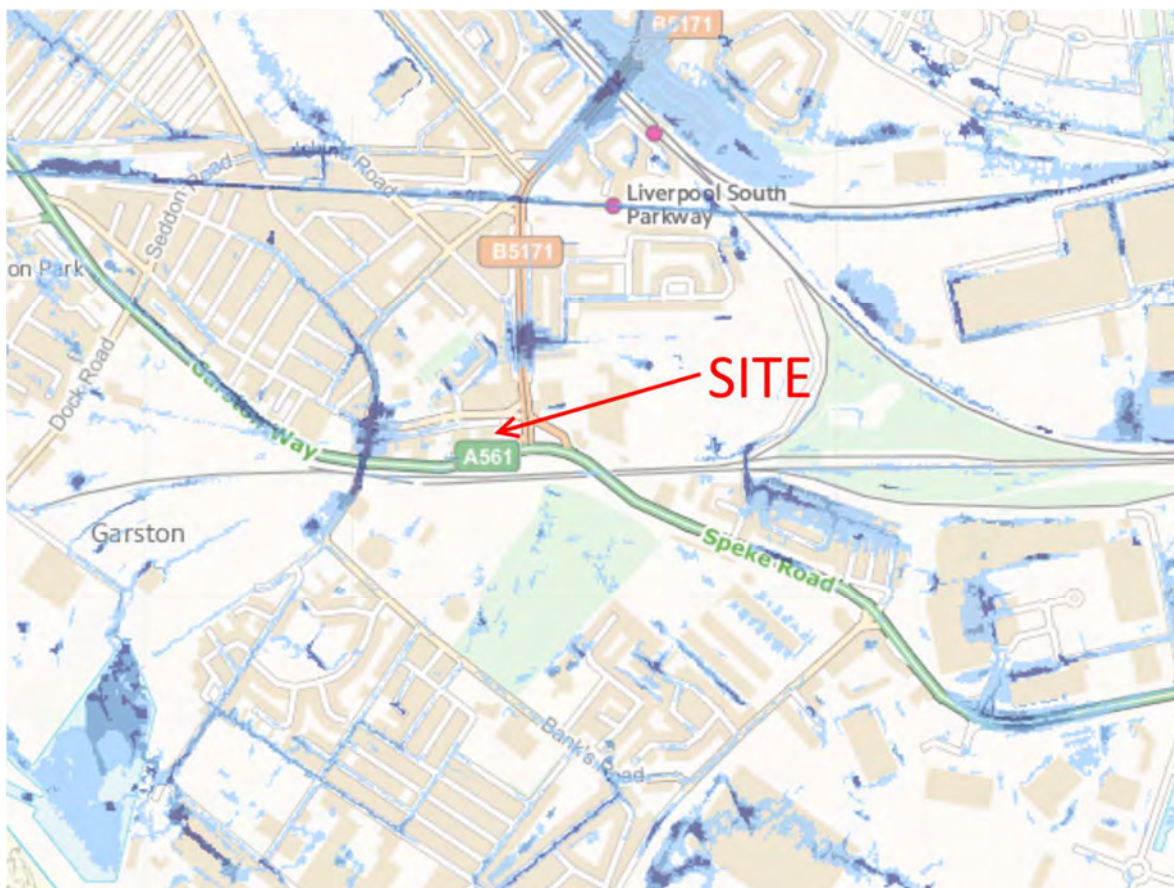


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Figure 2: Flooding from rivers ignoring flood defences

4.5 **Flooding from Land (Pluvial Flooding)**

- 4.6 An assessment of the topography of the site shows that as existing the site slopes down to the western boundary. A surface water flood map of the area has been obtained, as shown below.
- 4.7 The flood map, Figure 3, states that the site is in Flood Zone 1, very low risk. Land assessed as having a less than 1 in 1000 annual probability of surface water flooding (<0.1%).
- 4.8 The finished floor levels of the proposed buildings will be set higher than the surrounding land, roads and parking areas, and the ground will be designed to fall away from any proposed buildings.
- 4.9 Flooding from land is considered low risk.



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Figure 3: Flooding from land

4.10 Flooding from Groundwater

4.11 Groundwater flooding occurs when water levels in the ground rise above surface levels, and is more likely to occur in low lying areas. Any rainfall on the site will naturally drain towards the western boundary of the site.

4.12 The finished floor levels of the proposed buildings will be set higher than the surrounding land, roads and parking areas, and the ground will be designed to fall away from any proposed buildings.

4.13 Flooding from ground water is considered low risk.

4.14 Flooding from Sewers

4.15 Flooding due to lack of capacity of the public sewerage system in the event of heavy rain also needs to be taken into account. Any surcharge from the existing or proposed drainage network will follow the same path as explained in section 4.8.

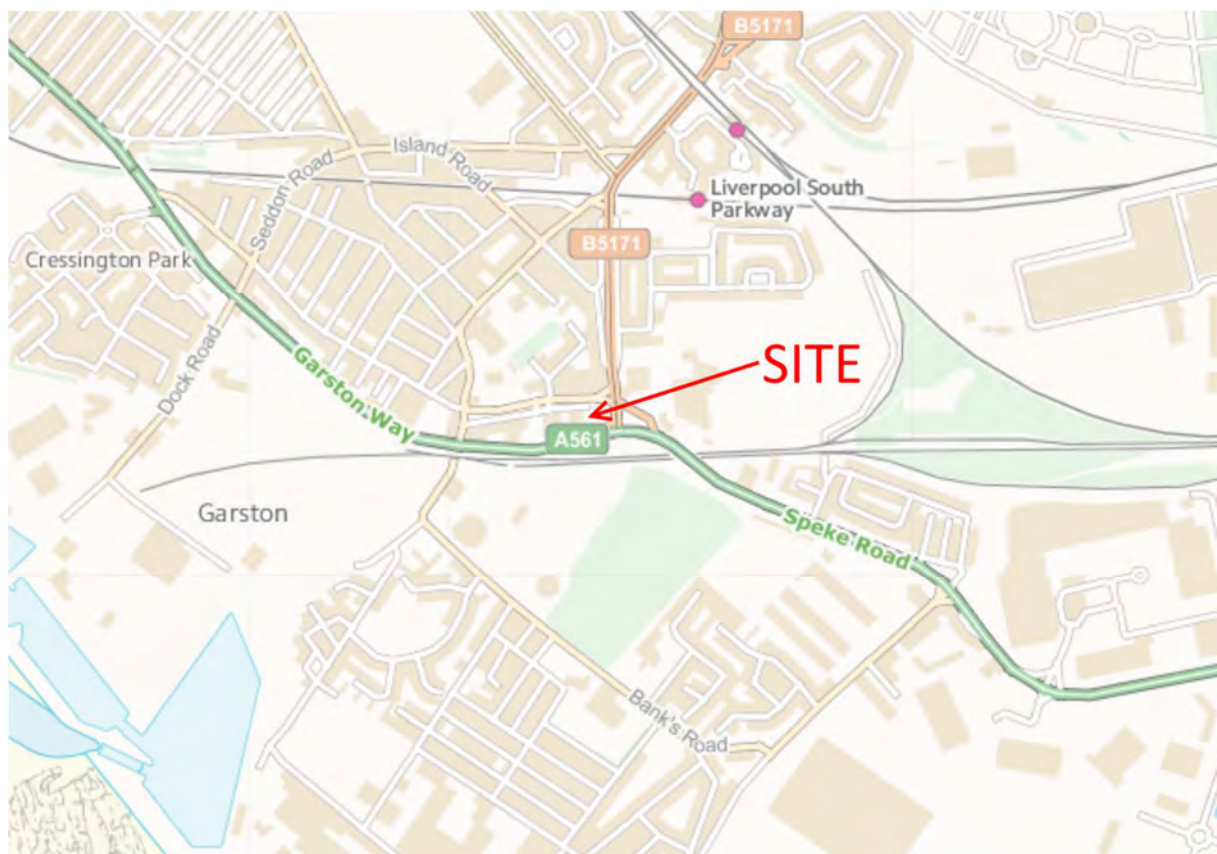
4.16 Flooding from sewers is considered low risk.

4.17 Flooding from Reservoirs

4.18 The flood map, Figure 4, states that the site is outside the area of maximum extent of flooding from reservoirs.

4.19 Reservoirs are inspected in accordance with the Reservoirs Act 1975; it is not pragmatic to design developments to deal with the results of a reservoir failing due to how unlikely it is to occur and the extent of the resulting flooding.

4.20 Flooding from reservoirs is considered low risk.



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Figure 4: Flooding from reservoirs

5.0 Drainage Appraisal

- 5.1 Surface water discharge will follow the ground, watercourse, sewer, hierarchy in accordance with the principles laid down in CIRIA Report 697 "The SUDS Manual" 2007.
- 5.2 Approval for proposed drainage connections, if required, will be sought from the relevant authorities prior to connections being made.

5.3 Surface Water Management Plan

- 5.4 Soakaway testing will be carried out as part of a Phase 2 intrusive ground investigation to determine if all or part of the surface water can be discharged into the ground.
- 5.5 British Geological Survey borehole records near to the site indicate that the local area is underlain by sand, and sandstone, as shown in Appendix C. The underlying strata means that soakaways may be possible but on site infiltration testing is required to confirm this.
- 5.6 Discharging to a watercourse will not be practicable because the nearest watercourse is the River Mersey approx. 1100m to the southwest of the site, across existing public highways and 3rd party land, therefore a surface water connection into the local watercourse is not viable.
- 5.7 United Utilities records show existing adopted combined sewers in Speke Road, and Arthur Street. It is likely that there are existing connections from the site into these sewers. Existing connections will be investigated as part of an on-site drainage connectivity survey, and if suitable will be reused by the proposed development.
- 5.8 Subject to the results of the soakaway tests, we consider that the most likely solution for the surface water disposal will be to the existing combined sewer in Speke Road.
- 5.9 The surface water drainage network will be designed to reduce surface water run-off to 70% of its existing figure, as calculated below.

Existing impermeable areas total = 3040m² (Existing building roofs and hardstanding car park)

Existing building roofs = 770m²

Existing hardstanding and car parks = 2270m²

Existing flow rate = 3040m² x 0.014 = 42.6 l/s

70% of existing = 42.6 l/s x 0.70 = 29.8 l/s allowable flow rate from developed site, this will be subject to the relevant third party approvals.

- 5.10 The surface water drainage network will be designed for a 1 in 30 year rainfall event without surcharge from the drainage network and provide sufficient retention on site for the 1 in 100 year rainfall event with an additional allowance of 20% for climate change.

5.11 Class 1 Bypass Interceptors will be provided for all areas where vehicle parking occurs.

5.12 **Foul Water Management Plan**

5.13 The foul water from the proposed development will to be connected to the existing adopted combined sewer in Speke Road.

6.0 Conclusions

- 6.1 The development is in a Flood Zone 1, low risk, land assessed as having a less than 1 in 1000 annual probability of river or sea flooding (<0.1%).
- 6.2 Flooding from rivers, sea, surface water, ground water, sewers, and reservoirs have been considered; the risk is considered to be low for these sources.
- 6.3 Subject to the results of the soakaway tests, we consider that the most likely solution for the surface water disposal will be to the existing combined sewer in Speke Road.
- 6.4 The foul water from the proposed development will be connected to the existing adopted combined sewer in Speke Road.



Peter Campbell

BSc (Hons), EngTech, TMICE,

For Dudleys Consulting Engineers Ltd

Appendix A

Existing site aerial plan



Hollys Mini Mart

Job Centre Plus

Horrocks Ave

Horrocks Ave

Speke Rd

Speke Rd

Funtown

Paul Antony Beds
& Bedrooms

Woolton Carpet Centre

Speke Rd

Arthur St

A561

A561

Speke Rd

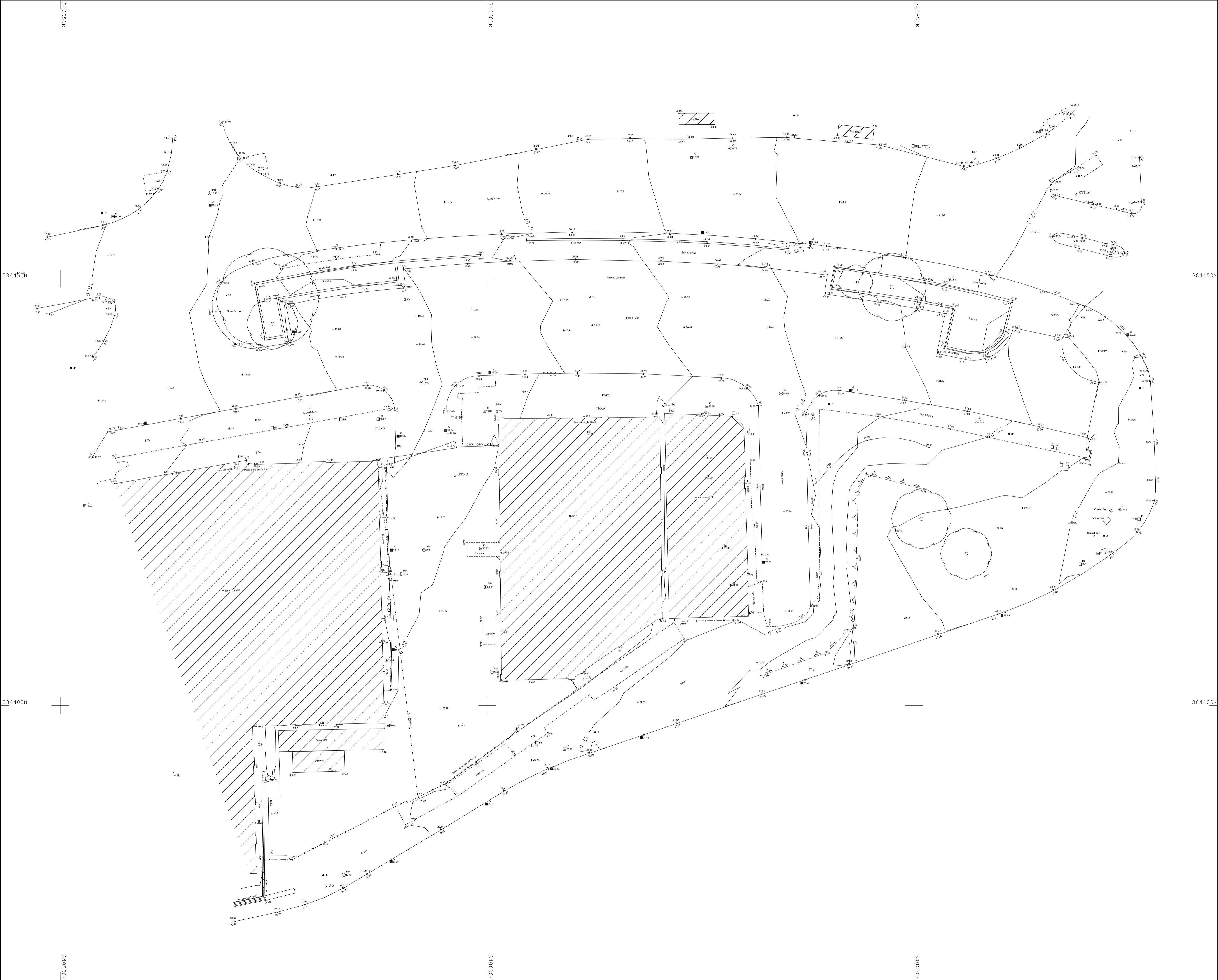
A561

Horrocks Ave

Appendix B

Existing site plan

Proposed site plan



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KEY TO SYMBOL/ANNOTATION

- STN -Survey Station
- MH -Manhole
- IC -Inspection Cover
- G -Gully Grate
- SV -Water Stop Valve
- GV -Gas Stop Valve
- WM -Water Meter
- FH -Fire Hydrant
- BT -Telecom Cover
- CATV -Cable Television Cover
- EC -Electric Cover
- ER -Earth Rod
- TP -Telegraph Pole
- EP -Electric Pole
- LP -Lamp Post
- SP -Sign Post
- SL -Slay
- DP -Downpipe
- SVP -Soil & Vent Pipe
- TL -Traffic Light
- Post -Post
- CCTV -Closed Circuit TV Pole
- BOL -Bollard
- PB -Post Box
- BS -Bus Stop
- RE -Rodding Eye
- BH -Borehole
- TH -Trial Hole
- OSBM -Ordnance Survey Bench Mark
- RH -Ridge Height
- EH -Eaves Height
- FFL -Finished Floor Level
- TH -Tree Height
- TBL -Top Boundary Level
- WL -Water Level
- THL -Threshold Level
- Tree -Tree
- Bush -Bush

LINETYPE

- Building
- Wall
- Fence
- Hedge
- Kerb
- Verge
- Foliage
- Gate
- Bank Bottom
- Bank Top

Station	Easting	Northing	Level
J1	340596.653	384397.574	20.267
J2	340574.748	384397.297	20.263
J3	340611.312	384403.039	20.353
J4	340638.207	384434.056	21.148
J5	340642.453	384407.151	22.079
J6	340581.192	384378.729	20.431
STN1	340554.984	384447.268	18.235
STN2	340601.712	384454.629	19.983
STN3	340596.277	384426.902	19.787
STN4	340620.584	384435.090	20.536
STN5	340669.025	384459.890	22.211

NOTES

Levels and Co ord related to OSGB36 National Datum and grid using GPS

Drawing scale 1:200 when plotted on A1 drawing sheet

REV.	DATE	DESCRIPTION	BY
-	-	-	-

OFFICE 2
THE OLD BANK CHAMBERS
37 MARKET PLACE
THIRSK
NORTH YORKSHIRE
YO7 1HA
TEL : 01845 574633
OFFICE@PREMIERDESIGNSURVEYS.CO.UK
WWW.PREMIERDESIGNSURVEYS.CO.UK

PROJECT

Speke Road
Garston
Liverpool

DRAWING TITLE

Topographical Survey

CLIENT

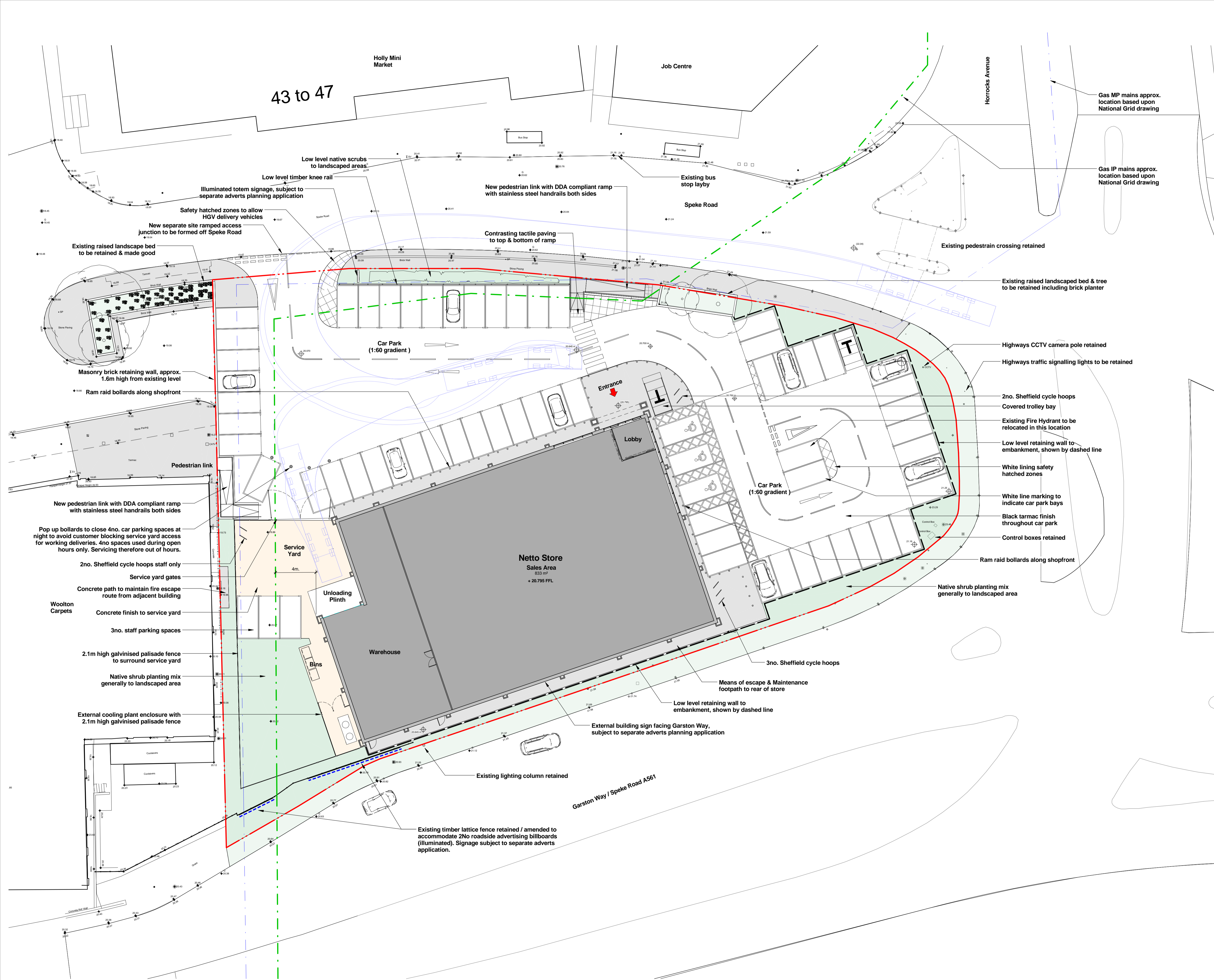
WPL Consulting

DRAWN	DATE
JR/PA	07/09/15

CHECKED	SCALE
JR/PA	1:200 @ A1

DRAWING NUMBER

2972-1



NOTES
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PROPOSED LEVELS SUBJECT TO DESIGN DEVELOPMENT.

DRAINAGE STRATEGY & RAIN WATER PIPES SUBJECT TO DESIGN DEVELOPMENT.

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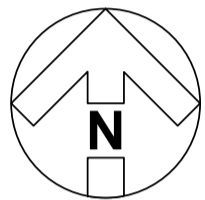
Topographical Survey by Premier Design Surveys, drawing: 2972-1, dated 07/09/2015. Received via email: 09/09/15.

National Grid drawing, map reference:- SJ4084, dated 08/06/2015. HCD received via email on 07/08/15.

SP Energy Networks drawing, map reference:- 340,622 384,400, dated 07/08/2015. HCD received via email on 11/08/2015

Openreach drawing, BT ref:- EZG01106Y, map ref:- SJ4062484418, dated 06/08/2015. HCD received via email on 07/08/2015

United Utilities, Commercial DW Sewer & Water Record, UU ref:- 1129722 - drainage & water sewerage. HCD received via email 11/08/2015



0 5 10
m
1:200

Foodstore Areas		
Sales Area	833 m²	8971 ft²
GIA	1045 m²	11249 ft²
GEA	1107 m²	11916 ft²
Car Parking Numbers		
Customer	59	
Disabled	3	
Staff	3	
Grand Total (incl. staff): 65		

REVISION A	BY: AJB	CHECKED: LARB	DATE: 19/10/2015
Timber lattice fence and roadside advertising billboards added to boundary with Speke Road A561.			
REVISION *	BY: DJW	CHECKED: LARB	DATE: 01/10/2015
Planning issue.			

INFORMATION

PLOT DATE: 19/10/2015 14:28:52



CLIENT:

Garston, Speke Road, Liverpool

PROJECT:

Proposed Site Plan

DRAWING:	SCALE:	CREATED DATE:
DJW	1 : 200 @ A1	Oct 2015

Hadfield Cawkwell Davidson

Broomgrove Lodge, 13 Broomgrove Rd, Sheffield, S10 2LZ T 0114 266 8181 www.hcd.co.uk

Architecture | Engineering | Interior Design | Masterplanning | Urban Design

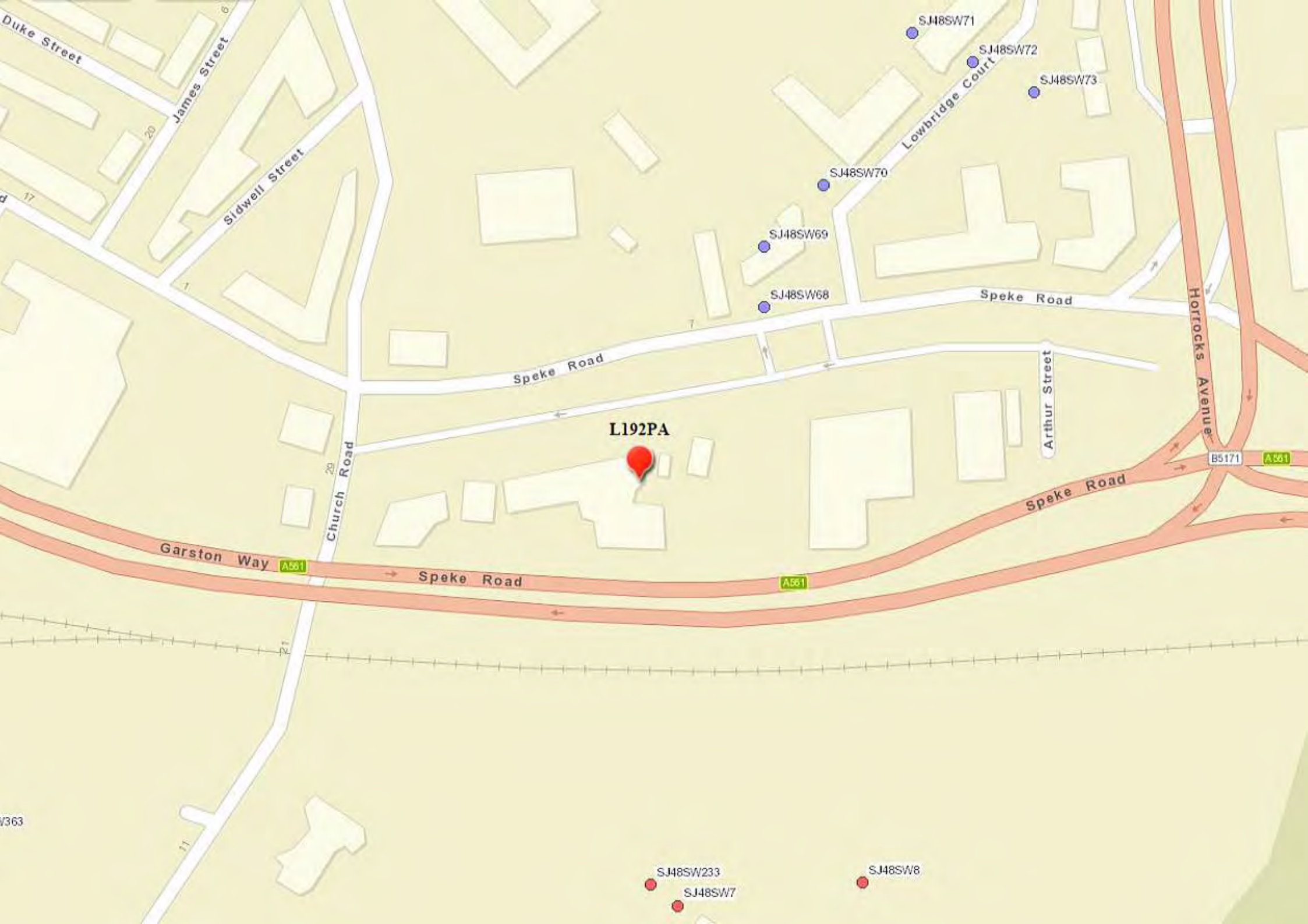
JOB NO: 2015-101 | DRAWING NO: A-PL-103 | REV: 1

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Appendix C

BGS borehole location plan

BGS borehole records



**British
Geological Survey**

NATURAL ENVIRONMENT RESEARCH COUNCIL

BGS ID: 164647 : BGS Reference: SJ48SW7

British National Grid (27700) : 340509,384263

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< Prev

Page 2 of 4 ▼

Next >

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WELL BORING at **SJ 48 SW 7** County **Leicestershire**
Geol. map **47** 1 in. map New Series **47** 6 in. map **Leicestershire 1135E**
Made by **Messrs J. Thom & Co.** British Geological Survey Date **1936**
Sunk **57** feet. Bored **1135E** feet.
Communicated by **Messrs J. Thom & Co. Artesian well by Messrs. Robinson.**
Height above Ordnance Datum **57** feet Rest level of water **-**
Yield **-**
Quality (with copy of analysis on separate sheet) **-**

GEOLOGICAL FORMATION.	NATURE OF STRATA.	THICKNESS.		DEPTH.	
		Feet.	Inches.	Feet.	Inches.
Concrete.		0	4	0	4
Cinders.		0	6	0	10
Soft red sandstone.		1	2	3	0
Red & grey sandstone.		1	6	4	6
Red sandstone.		75	6	80	0
Red marly sandstone.		3	0	83	0
Red sandstone.		27	0	110	0
Grey sandstone.		1	0	111	0
Red sandstone.		64	0	175	0
Red marly sandstone.		2	0	177	0
Red sandstone.		112	0	289	0
Red & grey sandstone.		2	0	291	0
Red sandstone.		9	0	300	0
Red & grey sandstone.		8	0	308	0
Red sandstone.		52	0	360	0
Red & grey sandstone.		2	0	362	0
Red sandstone.		14	0	376	0
Red & grey sandstone.		4	0	380	0
Red sandstone.		28	0	408	0
Red & grey sandstone.		4	0	412	0
Red marly sandstone.		2	0	414	0
Red & grey sandstone.		46	0	460	0
Red marly sandstone.		2	0	462	0
Red sandstone.		73	0	535	0
Red marly sandstone.		2	0	537	0
Red sandstone.		10	0	547	0
Red pebbly sandstone.		5	0	552	0
Red sandstone.		3	0	555	0
Hard red pebbly sandstone.		5	0	560	0
Red sandstone with layers of grey.		31	0	591	0
Hard red pebbly sandstone.		6	0	597	0
Hard red pebbly sandstone.		18	0	615	0
Red sandstone.		10	0	625	0
Red sandstone with pebbles.		4	0	629	0
Red pebbly sandstone.		22	0	651	0
Hard red pebbly sandstone.		4	0	655	0

BRITISH GEOLOGICAL SURVEY AND MUSEUM,
JERMYN STREET, LONDON S.W. 1.
(B10619). Wt. 13824—8123. 2500. 11/25. Gp. 160. O.A.



**British
Geological Survey**

NATURAL ENVIRONMENT RESEARCH COUNCIL

BGS ID: 164708 : BGS Reference: SJ48SW68

British National Grid (27700) : 340540,384460

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< Prev

Page 1 of 2 ▼

Next >

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SJ48SW/68

OSIRIS - CESCO LTD.				BOREHOLE No. 1			
SITE INVESTIGATION DIVISION				REPORT No. D82147			
LOCATION GARSTON BUS DEPOT				Ground/Bed Level			
Client MERSEYSIDE PASSENGER TRANSPORT EXECUTIVE				Coordinates 4054, 8446			
Method/Diameter 1 1/2 ton Pilcon 'Wayfarer' Shell and Auger rig. 200mm. dia. casing and boring 6.58m. bgl.				Boring Commenced 15/11/82 Boring Completed 16/11/82			
Ground Water observations are given at end of log		Remarks Concrete slab broken out between 0.00 and 0.31m. bgl with power tool. Chiselling between 5.10 and 6.50m. bgl.					

Description of Strata	Scale 1:50			Samples/Coring Record				
	Depth (m)	Reduced Level	Legend	Ref. No.	Type	Depth (m)		N blows/0.3m
						From	To	
Reinforced concrete slab.	0.31							
Medium dense, becoming loose red brown f.m.c. SAND with occasional rounded f.m.c. gravel and cobbles. (MADE GROUND)				1	D	1.00		
				2	C	1.00	1.45	(14)
				3	D	2.00		
				4	S/D	2.00	2.45	R
						2.45	2.90	8
Soft dark brown and grey silty sandy CLAY with coal gravel and thin bands of brown sand. (MADE GROUND)	3.10			5	D	3.00		
				6	D	3.10		
				7	U	3.15	3.60	(15)
				8	D	3.60		
Dark grey and yellow clayey f.m.c. SAND with occasional rounded chert cobbles.	4.55			9	D	4.00		
				10	U	4.05	4.50	
				11	W	4.10		
				12	D	4.50		
Light brown and grey subangular sandstone COBBLES and f.m.c. sand.	5.10			13	S/D	5.00	5.45	59
	5.50			14	D	5.10		
Red and grey f.m.c. grained SANDSTONE (recovered as gravel).				15	D	5.50		
GROUND WATER OBSERVATIONS								
Inflow observed at (m)	Visual rate of inflow	Water sealed off by casing at (m)						
4.10	Seepage	Not Sealed						
Date	Time	Hole Depth (m)	Casing Depth (m)	Water Level (m)				
15/11	1030	0.00	N11	Dry				
	1745	5.00	5.00	4.10				
16/11	0710	5.00	5.00	4.10				
	1030	6.50	N11	3.80				

Key: SAMPLES: U=Undisturbed. B=Bulk Disturbed. D=Disturbed. P=Piston. W=Water.
STANDARD PENETRATION TEST: S=Hollow shoe. C=Cone point. R=Refer to text or explanatory data sheet.
 () No. of blows to drive U sample.
 f = fine. m = medium. c = coarse.



**British
Geological Survey**

NATURAL ENVIRONMENT RESEARCH COUNCIL

BGS ID: 164709 : BGS Reference: SJ48SW69

British National Grid (27700) : 340540,384480

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< Prev

Page 1 of 2 ▼

Next >

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SS48SW / 69

OSIRIS - CESCO LTD		BOREHOLE No. 2	
SITE INVESTIGATION DIVISION		REPORT No. D82147	
LOCATION GARSTON BUS DEPOT, LIVERPOOL		Ground/Bed Level	
Client MERSEYSIDE PASSENGER TRANSPORT EXECUTIVE		Coordinates 4054, 8448	
Method/Diameter 1½-ton Pilcon 'Wayfarer' Shell and Auger rig. 200mm. dia. casing and boring to 8.05m. bgl.		Boring Commenced 16/11/82 Boring Completed 17/11/82	
Ground Water observations are given at end of log	Remarks Concrete slab broken out between 0.00 and 0.28m. bgl. with power tool. Chiselling between 3.05 and 4.50m. and 6.40 and 8.05m. bgl.		

Description of Strata	Scale 1: 50			Samples/Coring Record				
	Depth (m)	Reduced Level	Legend	Ref. No.	Type	Depth (m)		N blows/0.3m
						From	To	
Reinforced concrete slab.	0.28							
Loose red clayey silty f. SAND with a little sub-angular and sub-rounded f.m.c. gravel with occasional thin silt lenses. (MADE GROUND)				1	D	1.00		
				2	S/D	1.00	1.45	R 6
						1.45	1.90	
	2.00			3	D	2.00		
Medium dense, brown, f.m. SAND/ASH with a little subangular fm sandstone gravel and occasional partings of dark grey clay. (MADE GROUND).				4	S/D	2.00	2.45	13
	2.80							
	3.05			5	D	3.00		
Soft dark brown sandy CLAY.				6	U	3.00	3.45	(35)
Medium dense red subangular f.m.c. GRAVEL / SANDSTONE COBBLES with some f.m. sand and occasional brick fragments. (MADE GROUND)				7	W	3.05		
	4.85			8	D	4.00		
Soft black clayey SILT. (Possibly MADE GROUND)				9	C	4.00	4.45	12
	6.40			10	U	4.95	5.40	(15)
Medium dense, red and grey sub-angular and subrounded f.m.c. GRAVEL/SANDSTONE COBBLES.				11	C	6.45	6.90	26
	7.05			12	D	6.45		
Grey f.m. grained SANDSTONE.				13	D	7.05		
	8.05			14	C	7.50	7.53	R

Key: **SAMPLES:** U=Undisturbed. B=Bulk Disturbed. D=Disturbed. P=Piston. W=Water.
STANDARD PENETRATION TEST: S=Hollow shoe. C=Cone point. R=Refer to text or explanatory data sheet.
 () No. of blows to drive U sample.
 f = fine. m = medium. c = coarse.



**British
Geological Survey**

NATURAL ENVIRONMENT RESEARCH COUNCIL

BGS ID: 164713 : BGS Reference: SJ48SW73

British National Grid (27700) : 340630,384530

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< Prev

Page 1 of 2 ▼

Next >

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SJ48SW / 73

OSIRIS - CESCO LTD.				BOREHOLE No. 6						
SITE INVESTIGATION DIVISION				REPORT No. D82147						
LOCATION GARSTON BUS DEPOT, LIVERPOOL				Ground/Bed Level						
Client MERSEYSIDE PASSENGER TRANSPORT EXECUTIVE				Coordinates 4063, 8453						
Method/Diameter 1½-ton Pilcon 'Wayfarer' Shell and Auger rig. 200mm dia. casing and boring to 6.23m. bgl				Boring Commenced 23/11/82						
				Boring Completed 23/11/82						
Ground Water observations are given at end of log		Remarks Chiselling between 0.50 and 2.80m., and 5.05 and 6.05m. bgl								
Description of Strata		Scale 1: 50			Samples/Coring Record					
		Depth (m)	Reduced Level	Legend	Ref. No.	Type	Depth (m)		N blows/0.3m	
							From	To		
Reinforced CONCRETE.		0.28								
Concrete and brick COBBLES with f.m.c. sand and gravel. (MADE GROUND)					1	D	1.00			
					2	C	1.00	1.45	22	
Soft brown sandy silty CLAY with occasional cobbles.		2.30			3	D	2.00			
					4	C	2.00	-	R	
Light brown clayey silty f.m. SAND with occasional cobbles.					5	D	2.60			
					6	U	3.00	3.30		
					7	D	3.30			
Red brown sandstone COBBLES with f.m.c. sand.		3.95								
					8	C	4.00	4.38	R	
					9	D	4.00			
Red brown f.m.c. grained SAND-STONE (recovered as gravel).					10	S/D	4.50	4.73	R	
		4.85								
		5.05			11	D	5.00			
					12	D	5.50			
					13	S/D	6.00	6.23	R	
					14	D	6.05			
		6.23								
GROUND WATER OBSERVATIONS										
Inflow observed at (m)		Visual rate of inflow		Water sealed off by casing at (m)						
Not Record-		Seepage		Apparently not Sealed						
Date	Time	Hole Depth (m)	Casing Depth (m)	Water Level (m)						
23/11	1800	6.05	Pulled	2.50						

Key: SAMPLES: U=Undisturbed. B=Bulk Disturbed. D=Disturbed. P=Piston. W=Water.
STANDARD PENETRATION TEST: S=Hollow shoe. C=Cone point. R=Refer to text or explanatory data sheet.
 () No. of blows to drive U sample.
 f = fine. m = medium. c = coarse.

T100